LBL's Michael Manga

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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

GLAST completes tracker and calorimeter installation

The Gamma-ray Large Area Space Telescope (GLAST) team at the Stanford Linear Accelerator Center (SLAC) celebrated the installation of the 16th, and final, detector tower in late October. The telescope's detectors will form images of the gamma ray sky by measuring the direction and energy of each gamma ray that passes through it once it is launched into space in fall 2007. Each detector tower contains a silicon strip tracker detector and a cesium iodide calorimeter. Collaborating countries and institutions include the University of California-Santa Cruz, INFN in Pisa, Italy, the Italian Space Agency, Japan, Sweden and France.

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NREL releases estimates of new renewable energy capacity

DOE's National Renewable Energy Laboratory's (NREL) Energy Analysis Office (EAO) recently released estimates of renewable energy capacity that is being supported through green power markets in the United States. As of the end of 2004, more than 2,200 megawatts (MW) of new renewables capacity was being used to supply green power customers, with another 455 MW either under construction or formally announced. In assembling the data, EAO's green power analysis team focused on new renewable resources used to serve green power customers. For more information on how the analysis was conducted, as well as a table outlining specific technology capacity, go to the Green Power Network.

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Self-loathing water

Scientists at DOE's Pacific Northwest National Laboratory have observed a first: hydrophobic water. The team, working at the W.R. Wiley Environmental Molecular Sciences Laboratory, used rare gas physisorption to observe a single layer of water, or monolayer, of super-chilled ice wetting the surface of a platinum wafer and the second water layer beading up like drizzle on a freshly waxed car. The attraction of subsequent layers to that first hydrophobic water monolayer was so weak, in fact, that 50 or more ice-crystal layers could be piled atop the first until all the so-called non-wetting portions were covered. The results suggest that the protruding arms of the water molecules in the first monolayer that would normally provide attachment points for subsequent layers have instead turned inward, drawn by the strong interaction with the metal.

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Researchers harness *Shewanella*

Data on a microbe adept at bioremediation will be more efficiently organized and shared through a new $3 million project headed by DOE's Oak Ridge National Laboratory. The work builds upon advances made through a three-year consortium whose members have already sequenced the genome of seven strains of the *Shewanella*, a relatively common microbe. Working with the Joint Genome Institute, researchers hope to sequence the remaining eight strains by the end of 2006. This effort could have a dramatic impact on the bioremediation mission involving approximately 2 trillion gallons of heavy metal contaminated groundwater and 75 million cubic meters of soil and subsurface sediment at various DOE and other sites around the nation.

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DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Project secures material, saves $ millions

During the Cold War, the Atomic Energy Commission ordered the stockpiling of thorium nitrate for conversion into nuclear reactor fuel. ThN contains thorium-232, a naturally occurring radioisotope that can be transformed in a nuclear reactor to uranium-233.

As matters turned out, the thorium fuel cycle market never materialized and the government wound up with 7 million pounds of excess ThN on its hands. For the past several decades, the 21,000-barrel stockpile has been stored near a couple of large urban areas—Hammond, Ind., near Chicago, and Curtis Bay, Md., near Baltimore.

A multi-agency team that included the Defense Logistics Agency's Defense National Stockpile Center and DOE's Oak Ridge National Laboratory has moved the stockpile to safe and permanent storage at the Nevada Test Site.

The project, which began in 1999, was completed in late August. Besides removing the radiological material from those urban warehouses, the ORNL-led team saved taxpayers tens of millions of dollars.

For example, the ORNL team convinced regulators that the material would not react with oxygen and thus didn't require reprocessing for removal. That averted the necessity of designing, constructing and operating a $40-50 million processing plant.

Also, some of the casks of ThN had generated gases that turned the drums into potential bombs. The ORNL team devised a simple test for the presence of gas—they placed a steel bar across the top of the drum. If the top touched the bar, it meant gases had pooched out the top. Relatively few of the 21,000 drums indicated the pressurization; without the test, each drum would have required venting.

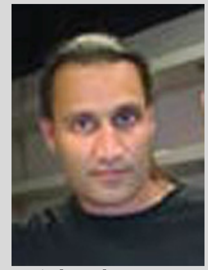
The ThN material itself presented challenges. Some was mined domestically; some came from Madagascar through France, and that material was more potent. The domestic-foreign difference had to be factored in arranging the shipments to make sure regulatory limits on transporting radiological materials weren't exceeded.

The eventual cost of the project was just over $17 million. Without ORNL's knowledge and technical sleuthing, the cost could easily have been as high as $70 million. And the team and its subcontractors accomplished the job with no lost-time accidents.

"This action was a huge win for the public and showed the agencies were able to work effectively together," project leader Bill Hermes, of ORNL's Nuclear Science and Technology Division, says.

Submitted by DOE's Oak Ridge National Laboratory

'Genius' earth scientist can now pursue volcanoes



Michael Manga

In September, on an otherwise typical Tuesday afternoon, geophysicist Michael Manga of DOE's Lawrence Berkeley National Laboratory answered the phone and was told he will receive $500,000 over the next five years - no strings attached.

He was one of 25 people chosen to receive MacArthur Foundation "genius" awards, which the foundation awards each year to people selected for their "creativity, originality, and potential."

"It was a complete surprise," says Manga, a scientist in Berkeley Lab's Earth Sciences Division and an associate professor of earth and planetary science at UC Berkeley.

Although the MacArthur Foundation keeps its selection process a closely guarded secret, it's little wonder that Manga caught their eye. Since coming to Berkeley in 2001, Manga, 37, has made a name for himself developing innovative ways to study volcanoes, earthquakes, and tidal pressures on planets. A tank filled with two tons of corn syrup sits in his lab, which he uses to simulate the Earth's mantle and crust. He also monitors the rise and fall of springs along the Hayward fault to learn how hydrological systems and earthquakes relate to each other. And he recently returned from Australia, where he studied desert springs that produce features similar to those found on Mars.

He plans to use the money to travel to volcanoes in Ethiopia and Tanzania, home to rare lava lakes that also appear on Jupiter's moon Io. He'll also pursue risky research that may not pan out, which makes for a tough sell to funding agencies.

"It's difficult to receive funding to study the connections between earthquakes and water, because there's a good chance I won't learn anything unless there's an earthquake," says Manga. "I'd like to use the money to improve the instrumentation at springs in the Mission Peak region, near Fremont, CA."

Manga has also recently turned to Berkeley Lab's Advanced Light Source to learn why some volcanoes erupt explosively, and why some don't. He uses infrared spectromicroscopy to measure bubbles in chunks of obsidian found in lava flows. He also uses CT tomography to learn how bubbles in lava-formed rock connect to each other. These analyses, conducted at a resolution approaching two microns, help him understand the processes that drive eruptions, which allows him to improve computer models of how volcanoes work.

Submitted by DOE's Lawrence Berkeley National Laboratory